Demographic patterns of sedentary and non-sedentary populations: Jesuit missions in lowland South America and Franciscan Missions in the Sierra Gorda Region of Mexico

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Abstract

This article discusses demographic patterns on Jesuit missions in lowland South America (Chiquitos, Guaraní) and the Sierra Gorda region of Mexico, including the effects of epidemics of highly contagious diseases such as smallpox and measles. It examines the differences in the demographic profile of sedentary and non-sedentary indigenous groups, as well as other factors that determined demographic patterns. It concludes that there were meaningful differences in demographic patterns.

Key words

Chiquitos
Sierra Gorda
sedentary/non-sedentary
historical demopraghy

Patrones demográficos de las poblaciones sedentarias y no-sedentarias: misiones jesuitas en las tierras bajas de Sudamérica y misiones franciscanas en la región de la Sierra Gorda de México

Resumen

Este artículo analiza los patrones demográficos sobre las misiones jesuíticas de las tierras bajas de América del Sur (Chiquitos, guaraní) y la región de la Sierra Gorda de México, incluyendo los efectos de las epidemias de enfermedades altamente contagiosas como la viruela y el sarampión. Se examinan las diferencias en el perfil demográfico de los grupos indígenas sedentarios y no sedentarios, así como otros factores que determinaron los patrones demográficos. Se llega a la conclusión de que había diferencias significativas en los patrones demográficos.

Palabras clave

Chiquitos
Sierra Gorda
sedentario/no-sedentario
demografía histórica

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Padrões demográficos das populações sedentárias e não-sedentárias:missões jesuítas nas terrais baixas da América do Sul e missões franciscanas na região de Sierra Gorda do México

Resumo

Palavras chave

Chiquitos
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Este artigo analisa os padrões demográficos das missões jesuítas nas terras baixas da América do Sul (Chiquitos, Guarani) e da região de Sierra Gorda do México, incluindo os efeitos de epidemias de doenças altamente contagiosas como a varíola e o sarampo. Ele examina as diferenças no perfil demográfico dos grupos indígenas sedentários e não sedentários, bem como outros fatores que determinaram os padrões demográficos. Concluiu-se que houve diferenças significativas nos padrões demográficos.

Scholars have examined the dynamics of demographic collapse of the indigenous populations in the Americas following sustained contact with Eurasians after 1492 from different perspectives. In a recent article and book I analyzed and offered an alternative interpretation of the paradigm of the so-called "virgin soil" epidemics (Jackson, 2014 y Jackson, 2015). The model of the "Virgin Soil" epidemic postulated that at initial sustained contact, epidemics of highly contagious "crowd" diseases such as smallpox and measles exacted a heavy mortality on indigenous populations, but that with the passage of time the population built-up resistance and gradually recovered. Detailed analysis of the vital rates of discrete populations documented epidemic mortality rates comparable to those postulated for "virgin soil" epidemics, and this nearly 200 years following first sustained contact. In some instances mortality was in excess of 50 and even 60 percent of the population of a given mission community.

In refining our understanding of post-contact and conquest indigenous demographic patterns, new parameters need to be considered. One is if there were meaningful differences in the demographic profiles of sedentary and non-sedentary indigenous populations, which is the focus of this article. I have previously hypothesized that non-sedentary indigenous populations congregated on missions proved to be demographically "fragile," meaning that in many cases they experienced demographic collapse when brought to live on missions (Jackson, 2015), and this is a paradigm that previous scholars have not explored. Moreover, there are examples of resistance to the transition to a sedentary life-style. Examples included the equestrian Abipones in the Chaco region of South America and the groups collectively known as the Karankawas that lived on the Texas Gulf Coast (Jackson, 2015: 128-133). The missionaries failed to convince or force the Abipones and Karankawas to adopt a sedentary way of life and the gender labor roles and social changes it implied.

Demographic differences between sedentary and non-sedentary populations first developed with the so-called "Neolithic Revolution" or the emergence of agriculture in the Middle East some 10,000 years ago and the resulting shift to a sedentary life style (Jackson, 2015: 128-133). The cost of raising children dropped with a sedentary life style. The families of sedentary populations tend to be larger for practical reasons. When children reached a certain age they could be put to work in agriculture, whereas young children could

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be a burden for highly mobile populations in terms of the logistics of the parents having to carry them from place to place. Studies also suggest higher survival rates among children of sedentary populations due, in part, to more food (Pennington, 1992). The families of non-sedentary populations could be expected to be smaller. On the other hand, sedentary populations became exposed to more infections, and in particular pathogens that evolved from domesticated animals. Measles is closely related to canine distemper and rinderpest that infects livestock, and smallpox most likely evolved from cowpox among livestock, perhaps in India (Dobson and Carper, 1996). Is there evidence of differences in family formation and family sizes between sedentary and non-sedentary populations congregated on the missions?

This study offers a comparative discussion of two groups of missions on the frontiers of colonial Spanish America established among sedentary and non-sedentary indigenous populations. The goal is an evaluation of the importance in the difference in demographic patterns between sedentary and non-sedentary populations in explaining the trajectory of the development of mission communities. The first case study is of the missions established by Franciscans from the apostolic college of San Fernando (Mexico City) in the Sierra Gorda region (Querétaro). The Sierra Gorda was a part of the Chichimeca frontier, and one of the points of conflict in the frontier war that began around 1550 as bands of nomadic hunters and gatherers resisted Spanish intrusion into their territory, and particularly the intrusion of cattle and sheep that competed for and destroyed plant foods that the nomads collected.

Missionaries from four orders -Franciscan, Dominican, Augustinian, Jesuit- established missions and attempted to evangelize the band members from the mid-sixteenth century to the early nineteenth century, with mixed results and considerable frustration for the missionaries as well as resistance by the native groups, the Pames and Jonaces, to the pressures to change their way of life. In the 1740s, royal officials attempted to accelerate the incorporation of the Pames and Jonaces into colonial society, and assigned missionaries from the apostolic colleges of San Fernando and Pachuca to the region.

The second case study is the Chiquitos missions located in the lowlands of eastern Bolivia. Jesuits established the first Chiquitos mission in 1691 among sedentary populations that lived in clans and practiced swidden agriculture. The Jesuits employed different methods in the creation and administration of mission communities, and their approach is compared to that of the Franciscans in the Sierra Gorda. This study also shows that there were distinct demographic patterns on the two groups of missions, and the analysis here not only shows the trajectory of change, but also the profile of the populations on the missions.

This study relies on a variety of sources to reconstruct the vital rates and demographic patterns on the two groups of missions. Sacramental registers of baptisms, burials, and marriages are one of the most important sources for reconstructing demographic patterns of discrete populations. However, only one baptismal register survives for the Chiquitos missions, and two for the Sierra Gorda missions established by the Franciscans. These registers are analyzed below. The Jesuits prepared particularly detailed censuses that summarized the total number of baptisms, burials, and marriages. The Chiquitos missions had open populations, which mean that the Jesuits periodically resettled non-Christians on the missions. The Jesuits did not distinguish in the censuses between baptisms of non-Christians and new-born children, but did so in the baptismal register analyzed below. This means that the crude birth rates

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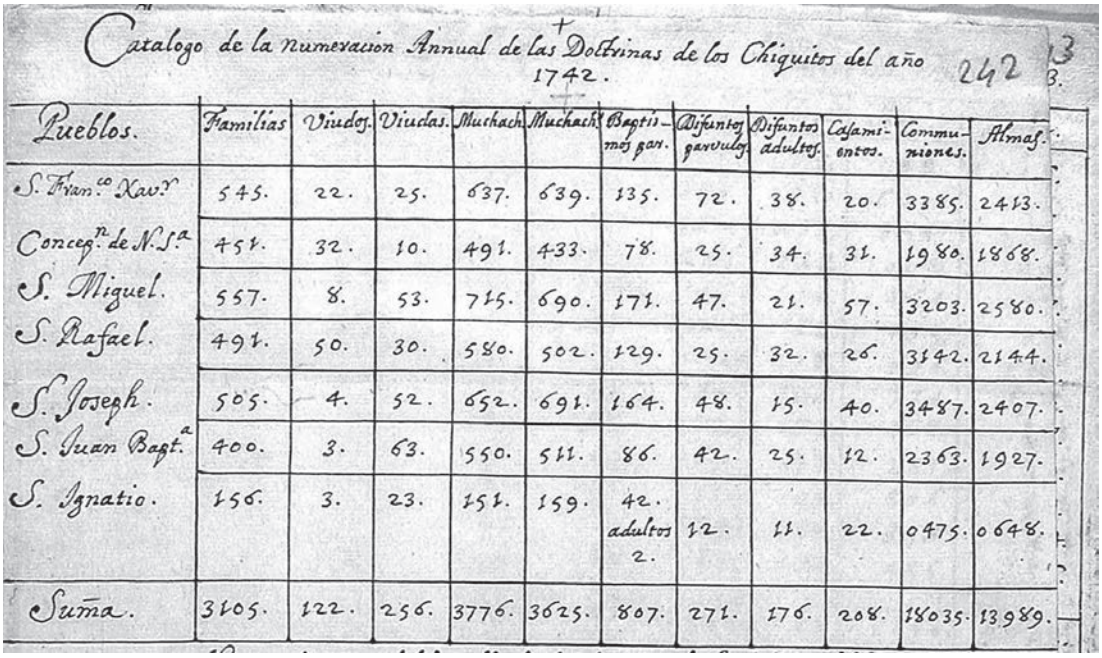
calculated from the censuses are slightly inflated for the years in which the Jesuits baptized numbers of non-Christians, but those years are also recorded in the record. In previous studies I used the censuses to reconstruct the vital rates of the missions (Jackson, 2015). The Franciscan reports on the Sierra Gorda missions only summarized the number of baptisms and burials recorded over a number of years, but this information is still useful for documenting overall demographic patterns and is supplemented by information from the two existing baptismal registers (Jackson, 2015: 133-143). Finally I have used detailed censuses to reconstruct the profile of the populations of selected missions. The following section examines the population of San Francisco Xavier, the first of the Chiquitos missions.



Catalogo de la Numeracion Annual de las Doctrinas de los Chiquitos del año 1742. 242

Pueblos.	Familias	Viudos.	Viudas.	Muchach.	Muchach.	Baptis-mos gen.	Difuntos parvulos.	Difuntos adultos.	Casami-entos.	Commu-niones.	Almas.
S. Fran.co Xav.r	545.	22.	25.	637.	639.	135.	72.	38.	20.	3385.	2413.
Concep.n de N.S.a	451.	32.	10.	491.	433.	78.	25.	34.	31.	1980.	1868.
S. Miguel.	557.	8.	53.	715.	690.	171.	47.	21.	57.	3203.	2580.
S. Rafael.	491.	50.	30.	580.	502.	129.	25.	32.	26.	3142.	2144.
S. Joseph.	505.	4.	52.	652.	691.	164.	48.	15.	40.	3487.	2407.
S. Juan Bapt.a	400.	3.	63.	550.	511.	86.	42.	25.	12.	2363.	1927.
S. Ignatio.	156.	3.	23.	151.	159.	42. adultos 2.	12.	11.	22.	0475.	0648.
Suma.	3105.	122.	256.	3776.	3625.	807.	271.	176.	208.	18035.	13989.

Figure 1. A 1742 Census of the Chiquitos Missions.

Demographic Patterns on San Francisco Xavier Mission (Chiquitania)

The available evidence shows that in most years the number of births and baptisms of non-Christians was greater than the number of deaths, and the mission populations grew at slow to moderate rates. Periodic epidemics, which were not as severe as in the Paraguay missions, slowed but did not stop population growth. For example, the population of San Francisco Xavier grew from 1,690 reported in 1718 to 2,342 in 1739, and 3,302 in 1765. In the years 1738 to 1767 for which there is a complete record, the Jesuits baptized 4,433 natives, both adults and children. In 25 years for which there is more complete information the Jesuits baptized 3,497 natives and recorded 2,764 burials, or a net difference of +733. Similarly, the population of Concepción increased from 1,087 in 1718 to 1,858 in 1739, and 3,287 in 1765. In 24 years for which there is complete data the Jesuits baptized 2,980 natives and registered 1,891 burials, a net difference of +1,089 (Table 1).*

* All the tables are shown at the end of the paper

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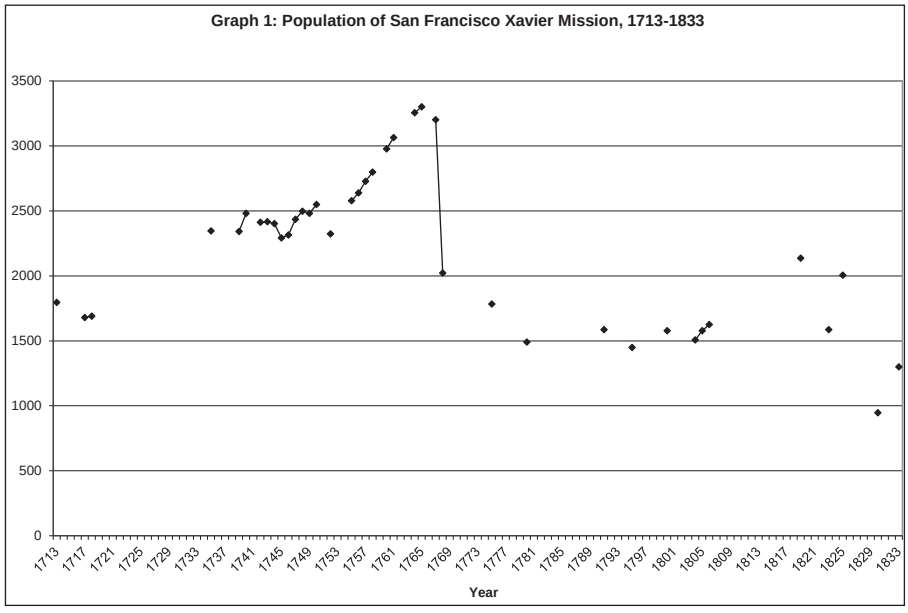
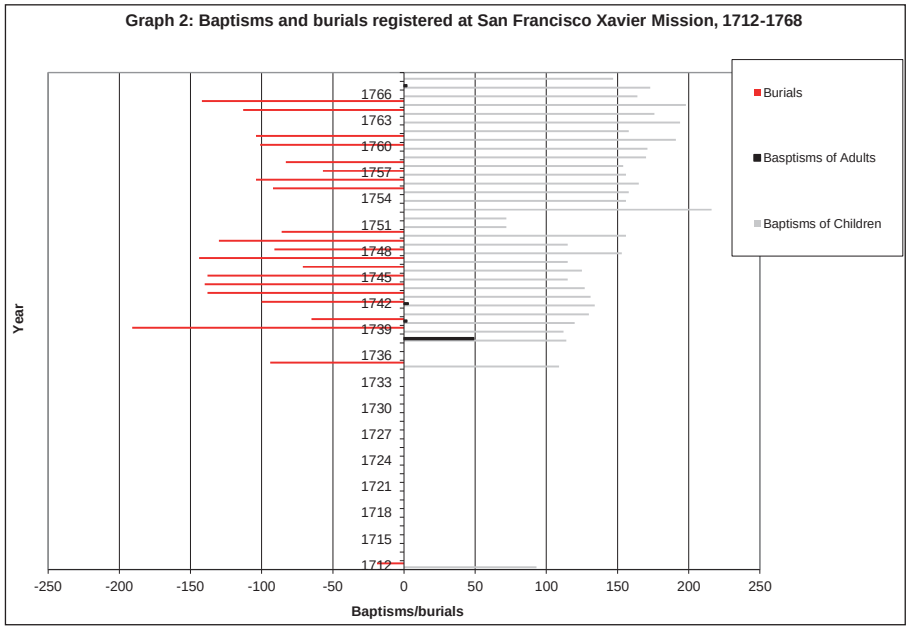
The Chiquitos mission can be characterized as having been high fertility and high mortality populations, meaning that death rates were high but in most years birth rates were higher. Moreover, the Jesuits periodically resettled non-Christians on the missions. In 1717, for example, the Jesuits congregated 24 non-Christians on San Francisco Xavier. In 1731, it was 142, 24 in 1738, another 100 in 1760, 322 in 1762, and 45 in 1763 (Jackson. 2015: 20). The population of San Francisco Xavier grew from 1,690 reported in 1718 to 2,342 in 1739, and 3,302 in 1765 (Table 1; Graphs 1 and 2).



Graph 1. Population of San Francisco Xavier Misson, 1713-1833.



Graph 2. Baptisms and burials registered at San Francisco Xavier Misson, 1712-1833.

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This is not to say that there weren't epidemics. The years 1738-1739, 1743-1745, and 1747 evidenced higher mortality rates. However, these were no major mortality crises on the scale documented for individual Paraguay missions. In 1738 and 1739, the Jesuits at San Francisco Xavier recorded 380 burials as against 267 baptisms, or a net decline of 113. The crude death rate reached an estimated 79.1 per thousand in 1738 and 81.6 in 1739. In contrast, 2,681 died at the Guaraní mission San Lorenzo during a catastrophic smallpox epidemic in 1739, and the population experienced a net decline of 2,521. The population of San Lorenzo was 4,814 at the end of 1738, and the number dropped to 974 at the end of the following year. Similarly, 416 reportedly died at San Francisco Xavier in the years 1743 to 1745 as against 373 baptisms, and a net decline in population of 43. The crude death rate reached 58.0 per thousand in 1743 and again in 1744, and 57.4 in 1745.

Many contemporary populations including those of the Paraguay missions evidenced a slight gender imbalance with more females -girls and women- than males. The evidence for San Francisco Xavier and the other Chiquitos missions shows that opposite, with slightly more males -boys and men- in most years. In 1742 and again in 1744 females represented a small majority, constituting 50.1 percent of the population in both years. In other years for which there is a record, on the other hand, there were more males. The lowest figure was of females constituting 44.4 percent of the population in 1713 (Jackson, 2015: 253-254).

What effect did this gender imbalance have on demographic patterns on San Francisco Xavier mission, and the Chiquitos missions in general? The Jesuits generally did not disaggregate births from the baptism of new convents in the extant baptismal register and censuses that registered the total number of baptisms and burials. However, they did differentiate between baptisms of children and adults. The calculation of crude birth rates is slightly inflated by the inclusion of converts as in 1738-1742 and 1767 when there were baptisms of adults, but not by much. Men may have had difficulty finding sexual partners, and marriage rates were lower when compared to the Paraguay missions which did not experience similar gender imbalances. The crude marriage rate per thousand population at San Francisco Xavier ranged from 9.1 to a high in non-crisis years of 18.6. The highest rates were 30.1 in 1746 and 35.4 in 1747. These higher rates followed three years of increased mortality from 1743 to 1745. They represented both the formation of new families, and remarriages of widows and widowers (Table 2).

A useful comparison can be made with marriage patterns on the Paraguay missions. Table 3 summarizes the number of marriages and marriage rates at San Francisco Xavier mission, located in Misiones Province in Argentina (Tables 2 and 3). One difference in the patterns on the two missions was the periodic registration of larger numbers of marriages at the Paraguay establishment. The Jesuits most likely performed large numbers of marriages at the same time, perhaps when a cohort of girls came of age. In 1739, for example, the Jesuits recorded 153 marriages, the largest number of marriages performed in a single year. This large number of marriages came at the end of a cycle of three epidemics that spread through the Paraguay missions between 1733 and 1740. The heaviest mortality during the decade was caused by smallpox in the years 1738-1740. The population of the mission dropped from 2,873 at the end of 1736 to 1,876 at the end of 1738, and to 1,710 in 1739. The net decline in population in 1738 and 1739 was 1,163. The evidence shows that the Black Robes performed few marriages during the epidemics, and none in 1736. The

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Jesuits opted to postpone marriages and remarriages until the epidemics had burned themselves out. There were also other years with a similar pattern of unusually large numbers of marriages, as in 1741 with 73, 1750 with 72, and 1762 with 62.

Patterns on the two missions were distinct. The mean crude marriage rate was lower on the Chiquitos mission at 16.4 per thousand population, as against 19.9 per thousand for the Paraguay establishment. There were larger numbers of marriages on the Paraguay mission even following population decline, and in the same period that the population of the Chiquitos missions was expanding. The Jesuits in both regions performed more marriages following epidemics, but there were no example in the Chiquitos missions of what appears to have been large cohort marriages in non-crisis years. The year 1762, for example, evidenced significantly higher numbers of marriages at several Paraguay missions including Santa Ana, Loreto, Corpus Christi, Concepcion, San Juan Bautista, and San Francisco Xavier.

The gender imbalance did not contribute to an imbalance in the age structure of the population of San Francisco Xavier mission. In other words children under about the age of 14 or 15 -the age at which children were generally considered to be adults and girls married following puberty- constituted a large percentage of the population. The Jesuits categorized children in this age group as *parvulos* and *muchachos*. The evidence shows that the population grew robustly, and that it was a young population with children constituting a large percentage of the total and in certain years more than half. However, periodic epidemics apparently killed a disproportionately larger number of children. This can be seen, for example, with an epidemic in the mid-1740s. The percentage of children in relation to the total population dropped from 52.9 percent in 1742 to 47.9 percent in 1747, after the epidemic had run its course (Table 4).

The population of San Francisco Xavier grew during most of the years prior to the Jesuit expulsion in 1767. From the 1,690 reported in 1718, the numbers nearly doubled by 1765, in which year the population was 3,302. What factors contributed to this growth? Birth rates were one factor, as was the resettlement of non-Christians, particularly in the 1760s. The Jesuits congregated 467 new converts on San Francisco Xavier in 1760, 1762, and 1763, and the population jumped from 2,799 in 1758 to 3,256 in 1764 and 3,302 in the following year (Jackson, 2015: 20, 260). The number of children also increased from 1,422 in 1758 t0 1,813 in 1764, suggesting that many of the non-Christians congregated on the mission were children. In the years 1760 to 1765, the Jesuits baptized 1,088 children, but no adults (Jackson, 2015: 260). The percentage relationship of children to the total population also increased from 52.2 percent in 1758 to 55.7 percent in 1764 (Table 4).

The expansion of the mission population ended with an epidemic in 1766 -most likely smallpox- that killed 265 or a crude death rate of 80.3 per thousand population, and the Jesuit expulsion in 1767. The population dropped to 2,019 in 1768, and continued to decline over the following decades. The population was 1,586 in 1797, 1,758 in 1800, 1,625 in 1806, and 1,576 in 1823 on the eve of Bolivian independence. Some mission residents elected to leave following the Jesuit expulsion, perhaps the most recently congregated or those brought to live on the mission from longer distances. However, despite the exodus, the nucleus of a stable community continued to exist at San Francisco Xavier in the last years of the colonial period.

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Demographic patterns on the Sierra Gorda missions

Augustinian, Franciscan, and Dominican missionaries attempted to evangelize the nomadic natives living in the Sierra Gorda region for nearly two centuries. Small colonies of sedentary natives coexisted with bands of nomadic natives collectively known by the Spanish by the derogatory term *Mecos Barbaros*. They lived in small bands scattered across the mountainous region, and the missionaries failed to convince them to abandon their way of life and settle on permanent mission communities. In the 1740s, the Crown named José de Escandón to colonize the region known as Nueva Santander, and to promote the evangelization of the Sierra Gorda.

Figure 2. Photo of a part of the larger Sierra Gorda region.

In 1743, De Escandón conducted a survey of the Sierra Gorda region. Lucas Cabeza de Vaca, O.S.A., administered the Augustinian mission at Xalpa. The mission district consisted of Xalpa, the settlements of San Juan Pisquintla San Juan Sagav, Atacama, Santiago de Tongo, Santo Tomás de Sollapilca, San Agustín Tancoyol, San Nicolás Malitlaand, San Antonio Amatlán, and San Nicolás Concá, which was a hacienda that belonged to one Gaspar Fernández del Pilar de Rama. There were thirteen small settlements described as *rancherías*. The Augustinian churches were described as *jacales*, or wattle and daub construction. De Escandón described and enumerated the missions in the region staffed by Dominicans, Franciscans, and the Augustinians. The Augustinians administered several larger Pames settlements classified as *rancherías* that they visited periodically from the missions at Xilitlán, Pacula, and Xalpa.

Fray José Ortés de Velasco, O.F.M., from the Apostolic College of San Fernando, visited the Sierra Gorda in 1739, and in the following year convinced 73 Jonaces to settle on the reestablished mission at San José de Vizarrón -previously San José del Llano-. The Franciscans from San Fernando administered the mission at Vizarrón differently than did the Franciscans from Pachuca who staffed the Jonaces mission at Tolimán. The missionaries expected the Jonaces settled on Vizarrón to radically change their way of life in a short period of time, and in particular to become a disciplined labor force to work in communal agricultural

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production and ranching. The Jonaces did not respond well to this approach of directed social-cultural change, and the majority had abandoned the missions by 1748. In response, royal officials used force to recapture the fugitives, and distributed the natives among *obrajes* (textile mills) as forced laborers (Alvarez Icaza Longoria, 2010). In contrast, the Jonaces at Tolimán continued to collect wild foods and were not subject to the same pressures to change their way of life and to become a disciplined labor force (Alvarez Icaza Longoria, 2010: 25). The Franciscans from San Fernando experienced a similar problem with the nomadic hunter-gatherer group known as the Guaycuros, who lived on Todos Santos mission in southern Baja California. The Fernandinos tried to convert the Guaycuros into a disciplined labor force after they replaced the Jesuits in Baja California in 1768, but the Guaycuros also resisted the forced and rapid change in life-style. The Franciscans ended up having to hire laborers to work the Todos Santos mission lands (Jackson, 2004).

De Escandón gave the Fernandinos jurisdiction over the Augustinian mission at Xalpa and the *visitas* at Tancoyol and Concá, and ordered the establishment of new missions at Landa and Tilaco. The Franciscans congregated thousands of Pames on the new and reorganized missions. A census prepared in 1744 enumerated 3,767 Pames congregated on the five missions, with the largest number settled on Xalpa (Gómez Canedo, 2011: 95, 105). Periodic epidemics decimated the mission populations, and flight was one common response to the outbreak of contagion.

Figure 3. The Franciscan mission complex at Concá.

There were two severe epidemic outbreaks in the Sierra Gorda missions during the first two decades of the Franciscan administration. A report drafted about 1748 noted that in four years 1,422 Pames had died at four of the missions -there is no data for Tancoyol- (Gómez Canedo, 2011: 215-220). Martín de Heredia, O.F.M., Juan de Urinate, O.F.M., and Lucas Ladrón de Guevara, O.F.M., all died during the 1746-1747 outbreak (Gómez Canedo, 2011: 137). A smallpox epidemic in 1762 killed hundreds of Pames, as well as three Franciscan missionaries. Some 200 Pames died from smallpox in 1762 at Tilaco (Gómez Canedo, 2011: 124). The Franciscans maintained the population levels of the missions through the congregation of non-Christians although the

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populations of the missions slowly declined (Table 5). However, the fragility of the mission populations becomes evident on examining the net balance between baptisms and burials on the missions. Several reports summarize the total number of baptisms and burials recorded between 1744 and 1764 (Table 6). Over two decades there were 1,782 more burials than baptisms. During the same period of population of Xalpa dropped from 1,445 in 1744 to 869 in 1762. The recruitment of non-Christians buffered the decline on the other missions. Flight from the missions which reflected the unwillingness of many Pames to abandon their way of life also continued to be a problem (Gómez Canedo, 2011: 131).

Burial registers do not exist for the Sierra Gorda missions. However, the extant reports recorded the total number of burials in rough age groups, *párvulos* (under age six) and adults including children over age six. The data for Tancoyol is incomplete, because a fire in April of 1747 destroyed the church and the baptismal and burial registers. Burials at Tancoyol between 1747 and 1758 totaled 292 adults and 239 *párvulos* (Gómez Canedo, 2011: 226-229). The 1758 report for Landa recorded burials of 303 adults and 329 *párvulos* between 1744 and 1758 (Gómez Canedo, 2011: 230). The total reported for Tilaco was 286 burials of adults and 348 of *párvulos* in the same years (Gómez Canedo, 2011: 232). Finally, burials at Xalpa totaled 601 adults and 721 *párvulos* (Gómez Canedo, 2011: 234). The Sierra Gorda evidenced distinct mortality patterns from those documented for the Paraguay and Chiquitos missions. Prior to the concerted effort to congregate the natives on the five Franciscan missions, the Pames lived in a dispersed pattern in small and often isolated settlements in the valleys and mountains. This settlement pattern most likely buffered somewhat the effects of epidemics. Once brought to live on larger nucleated communities, on the other hand, contagion more readily spread from mission to mission, and mortality was higher among more of the population, both adults and children, that was particularly susceptible because it had not been previously exposed.

Two crude measures show a different dynamic than documented on the Chiquitos missions, with smaller numbers of children in relation to the total population. The first is the calculation of the average family size (AFS), which gives a general idea of family size. Table 7 summarizes the AFS on the Sierra Gorda missions in selected years, and shows a pattern of smaller families than on the Chiquitos missions and in most years an average of only one child per family. Families of this size were too small to guarantee the reproduction of the population. The calculation of children -under the age of 15- as a percentage of the total population provides a second useful comparison with the Chiquitos missions. Children constituted a smaller percentage than on the Chiquitos missions, and in some instances less than a third of the total. Several factors perhaps explain this pattern. Infant and child mortality rates were likely high, and increases in the number of children result from birth rates but also the periodic baptism of non-Christians. This last perhaps explains the increase in the percentage relationship of children to the total population at Conca and Landa in the 1760s (Table 8). In the absence of more complete records, the explanation offered here for the causes of the patterns observed on the Sierra Gorda missions is more a hypothesis.

Other comparisons can be made between the Sierra Gorda missions and other missions located on the northern frontier of New Spain with similar types of populations, in this case the Pimeria Alta, Baja California, and California. The natives congregated on the Pimeria Alta missions were sedentary

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agriculturalists that also practiced seasonal transhumance for the collection of wild plant foods and also for hunting. Periodic epidemics reduced the mission populations that also experienced high infant and child mortality rates. A family reconstitution of a sample of 123 children born on Guevavi-Tumacacori mission in the years 1773-1825 shows that 46 percent died within the first year, and only seven percent reached age ten (Jackson, 1994: 65). The Jesuits and later the Franciscans who replaced them following the expulsion maintained the mission populations largely by congregating non-Christians.

The natives living on the Baja California missions were nomadic hunters and gatherers, and more closely resembled the Pames congregated on the Sierra Gorda missions established in the 1740s. The populations experienced high epidemic mortality and chronically high infant and child mortality rates, and experienced rapid demographic collapse. For example, a series of reports prepared by the Jesuit missionaries in 1744 recorded the total number of baptisms at individual missions up to the point of the drafting of the reports, as well as the populations. Baptisms at eight missions reportedly totaled 14,830 and the population of the same missions was 4,220. This indicates a decline of 72 percent from the number of people the Jesuits baptized (Jackson, 1994: 18). A family reconstitution of Santa Rosalia de Mulege mission showed that of a sample of 142 children born to 75 women between 1771 and 1835, 50 percent died before reaching age one and only six percent lived to age ten (Jackson, 1994: 71). The native populations reached the point of near biological and cultural extinction within 100 to 150 years of the establishment of the first mission in the Peninsula.

The final example is the pattern of high mortality and particularly high infant and child mortality on five missions established in California among the group known today as the Chumash. The populations of the five missions only increased during periods of the resettlement of large numbers of non-Christians, and rapidly declined once the number of new converts settling on the missions dropped. Most children born on the missions did not live to age ten, and the mission populations were not demographically viable. In other words, they did not grow through natural reproduction as did the populations on the Chiquitos missions. They more closely paralleled demographic patterns on the Sierra Gorda missions (Jackson, 2015: 150).

The most complete record among the five Sierra Gorda missions exists for Tilaco and Tancoyol, and included detailed censuses prepared in 1744 that enables the construction of a detailed profile of the population when the Franciscans arrived, as well as baptismal registers. The 1744 censuses prepared when José de Escandón oversaw the establishment of the five Franciscan missions divided the population into family groups, and also identified widowers and widows and their children and single adults. The censuses also differentiated between those couples married by the Catholic Church, and those not. The number of cases of relationships of couples not in Church sanctioned marriages totaled 49 at Tancoyol, or 23 percent of the families. The figures at Tilaco were even higher. Of 184 families enumerated at Tilaco, El Lobo, and Laguna Grande, 121 or 66 percent were not in Church sanctioned marriages. None congregated at Tilaco had been married by the Church, whereas the majority at El Lobo and Laguna Grande were. A substantial number of Pames had formed families along traditional lines, and particularly those that preserved their traditional way of life in small settlements in the mountains. The majority of the couples at Tancoyol, Soyapilca, El Lobo, and Laguna Grande, communities with a longer

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period of contact with missionaries and sedentary natives, had been married by the Church (Meade y Sainz Tapaga, 1951: 408-413, 425-431).

Figure 4. The Franciscan mission complex at Tilaco.

The act of possession at Tilaco on May 1, 1744, provides more details regarding this dynamic. The Augustinians stationed on the *doctrina* at Xilitlan had had jurisdiction over the sedentary natives at El Lobo and Laguna Grande. Luis de Trejo, O.P., who presided over the transfer of the Augustinian jurisdiction to the Franciscans, noted that he could not turn the original sacramental registers over to the Franciscans, since they also contained the baptisms, burials, and marriages of the Otomi and Nahuas, who remained under their jurisdiction. The Augustinian offered to have a copy made of the records for the Pames, who were now the Franciscans's responsibility. The same was the case with the church ornaments that the Augustinians retained for their Otomi and Nahuas congregants (Meade y Sainz Tapaga, 1951: 403-404). It is not clear if the natives enumerated at El Lobo and Laguna Grande were all Pames, or were also Otomies and Nahuas. The Augustinians had not had jurisdiction over the valley where the Franciscans established Tancoyol, and did not participate in the establishment of that mission (Meade y Sainz Tapaga, 1951: 422-423).

The censuses (Tables 9 and 10) reveal subtle differences in the family structure of the communities enumerated. The majority of couples had no children, or only one or two. At Tancoyol and Soyapilco, 65 percent and 75 percent of the families respectively had two or fewer children. Similarly, 72 percent of the families at Tilaco had two or fewer children, 65 percent at El Lobo, and 60 percent at Laguna Grande. Two factors most likely explain this pattern. One was the small size of families in nomadic populations, coupled with high infant and child mortality. The Franciscans may have encouraged larger families, but could not solve the problem of high mortality rates.

To maintain population levels, couples would have to have had to children survive to adulthood, and three or more for population growth. There were a number of larger families with three, four, or five children enumerated in the 1744 censuses. The populations of Tancoyol, Soyapilca, and Tilaco counted 28 percent, 25 percent, and 26 percent of families having three to five children. The populations of El Lobo and Laguna Grande evidenced a somewhat different

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dynamic with a larger number of families with three or more children; 35 percent and 40 percent respectively. This may indicate a difference between the structure of the population of Otomi-Nahuas.

How did the structure of the populations of Tancoyol and Tilaco compare to the populations of the Jesuit missions of lowland South America? Detailed tribute censuses of the Paraguay and Chiquitos missions also divided the population into family groups. The most valid comparison can be made based on censuses prepared in years that did not evidence mortality crisis. A comparison is made based on a 1759 count of the population of Corpus Christi mission (Misiones, Argentina). Corpus Christi had a high fertility and high mortality population with high birth rates and robust growth. The numbers increased from 4,192 in 1750 to 4,753 in 1759, the year of the population count. Moreover, it was a young population. Children and adolescents under the age of 19 constituted 58 percent of the population. The family size on the mission ranged from two to nine, and there were families larger than those documented for Tancoyol and Tilaco. Moreover, families with three to seven children constituted 47 percent of all families, a higher percentage than on the two Sierra Gorda missions (Jackson, 2015: 101, 103, 225).

Figure 5. The Franciscan mission complex at Tancoyol.

A second comparison can be made with the family structure of the populations of two of the Chiquitos missions based on a detailed 1745 tribute census. The two missions are San Francisco Xavier and Concepcion. Both missions evidenced robust populations with families that ranged in size from two to ten. In the case of San Francisco Xavier, 65 percent of the families ranged in size from two to four, and 35 percent above four and from three to eight children. More importantly, however, 51 percent of the population enumerated in families was in families with three or more children -excluding widows and widowers and their children-. With this dynamic the population of San Francisco Xavier grew through natural reproduction, as already discussed above. Similarly, 65 percent of the families living on Concepcion mission had a size of from two to four, but 55 percent of those enumerated in families were in families that ranged in size from five to ten. Although the ages recorded in the tribute censuses are not reliable, they do document an early age of marriage

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for women living on the Chiquitos missions, and as early as age 13 or 14. Those women of child bearing age that survived childbirth and other health threats bore many children, since there were no economic restraints on family size. The census also shows that a sufficient number of children survived to adulthood to form new families, and reproduce the population.[1] The sedentary populations of the two Chiquitos missions evidenced different patterns from the nomadic populations of Tancoyol and Tilaco, and grew through natural reproduction.

1. Testimonio de los autores originales de la visita y empadronamiento que en virtud de Real Cedula de su Majestad (que Dios guarde) hizo el senor doctor Francisco Xavier de Palacios, Oidor y Alcalde de Corte de esta Real Audiencia de los Charcas, de los pueblos de las santas misiones de los indios de la nacion nombrada chiquitos. (Archivo General de las Indias, Seville, Spain, Charcas 291).

Baptismal registers exist for Tancoyol and Tilaco missions, and provide additional information regarding demographic patterns on the missions. The register for Tancoyol records the first baptisms in 1747, but the Franciscans only started recording complete information on those baptized in 1754. In other words, they only began to record information in the individual baptismal entries as to whether it was a newborn child or a non-Christian resettled on the mission. The Franciscans stationed on Tilaco only began to record the complete information in 1753. Therefore, the analysis of baptismal patterns is limited to these years.

Between 1754 and 1770, the year that the Franciscans turned the mission over to parish priests following the secularization of the five Sierra Gorda establishments, they baptized 383 children born on the mission and several other *rancherías* administered from Tancoyol. That was an average of 23 births per year. The summary of the number of burials at Tancoyol indicates that the Franciscans on average buried 39 natives per year. The number of deaths was greater than the number of births. There were still unbaptized natives in the Tancoyol district. The Franciscans baptized 31 adults and 23 young children who were non-Christians. Between 1752 and 1765, the Franciscans stationed on Tilaco recorded 435 births, or an average of 31 per year. The crude birth rate can be calculated for several years. It was 39.1 per thousand population in 1759, 35.3 in 1762, and 45.5 in 1765, which were a bit lower than birth rates on the Chiquitos and Paraguay missions. The Franciscans recorded an average of 57 burials per year. From 1750 to 1765, the Franciscans baptized 56 adults who previously had not been baptized. Even with the influx of small numbers of non-Christians, the population of Tilaco constantly declined as the number of deaths was consistently greater than the number of births and baptisms of non-Christians (Jackson, 2015: 140-143).

Conclusions

The comparison of the demographic profile of the Pames population with that of the Guarani and the natives congregated on the Chiquitos missions highlight the differences between sedentary and non-sedentary populations. The residents of the Chiquitos missions experienced robust birth rates, and experienced growth in non-crisis years. This can be seen, for example, in larger family sizes and higher birth rates and rates that were higher than death rates in non-crisis years. Moreover, the sedentary populations proved resilient in the face of catastrophic mortality and particularly mortality from smallpox that in the case of individual missions reached 40 or even more than 50 percent of the population of individual mission communities. Following catastrophic mortality marriage rates increased, new families were formed and higher birth rates led to population growth. The Chiquitos mission populations were viable, whereas the Pames population was not. The evidence for the Sierra Gorda missions shows that the Pames mission populations experience catastrophic epidemic mortality, and higher death rates than birth rates. The

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congregation of the Pames on the Franciscan missions accelerated the process of demographic collapse.

The demographic patterns on the five Franciscan missions in the Sierra Gorda were not unique. There are many other examples of non-sedentary populations that have experienced demographic collapse when brought to live on missions in the seventeenth and eighteenth centuries. Examples include the non-sedentary groups living in the Pampas and Chaco, although the analysis of the equestrian Chaco groups such as the Abipones show a distinct pattern of resistance and engagement with the Jesuit missionaries. On the frontiers of Mexico there are numerous examples. The Chichimec groups, including the Pames and Jonaces, disappeared over time. The populations of the Coahuila-Texas frontier, Baja California, and California experienced a similar fate (Jackson, 2015: 125-160). At the same time sedentary mission populations survived despite catastrophic mortality. Examples include those documented in this study such as the Guarani on the Paraguay missions, the populations of the Chiquitos and Tarima missions, and populations in parts of Sonora and Sinaloa in northern Mexico. One important point of comparison is of epidemic mortality in the Paraguay and Chiquitos missions. The Paraguay missions were connected to other communities in the larger Rio de la Plata region by navigable rivers and contagion spread rapidly along the rivers. Epidemic mortality in the Paraguay missions was much higher than in the geographically isolated Chiquitos missions.

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Baptisms								
Year	**Families**	**Population**	**Children**	**Adults**	**Burials**	**CBR**	**CDR**	**AFS**
1712	478	1955	93		19	49.4*	10.1*	4.0
1718	505	1688	75		22	44.6	13.1	3.3
1735	605	2345	109		94	46.8*	40.3*	3.9
1738	559	2342	138	7	189	57.8*	79.1*	4.2
1739	560	2364	111	1	191	47.4	81.6	4.2
1740	564	2481	120	2	65	50.8	27.5	4.4
1741	558	2378	130	3	75	52.4	30.2	4.3
1742	545	2413	135	3	110	56.8	46.3	4.4
1743	546	2416	131		138	55.1	58.0	4.4
1744	556	2403	127		140	52.6	58.0	4.3
1745	552	2293	115		138	47.9	57.4	4.2
1746	582	2314	125		71	54.5	31.0	4.0
1747	612	2435	115		144	49.7	62.2	4.0
1748	620	2497	153		91	62.8	37.4	4.0
1749	622	2480	115		130	46.1	52.1	4.0
1750	633	2550	156		86	62.9	34.7	4.0
1751			72			28.2		
1752		2323	72					
1753			216					
1754			156					
1755	606	2578	158		92	62.9*	36.6*	4.3
1756	615	2639	165		104	64.0	40.3	4.3
1757	631	2728	156		57	59.1	21.6	4.3
1758	642	2799	154		83	56.5	30.4	4.4
1759			170					
1760	656	2978	171		101	58.8*	34.7*	4.5
1761	666	3065	191		104	64.1	34.9	4.6
1762			158			51.6		
1763			194					
1764	703	3256	176		113	55.1*	35.4*	4.6
1765	728	3302	198		142	60.8	43.6	4.5
1766	720	3201	164		265	49.7	80.3	4.5
1767			173	2				
1768		2022	147			45.9		

*Estimated

Source: Robert H. Jackson (2015: 260).

Table 1. The population and vital rates of San Francisco Xavier Mission, in selected years.

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Year	Number of marriages	Crude marriage rate
1739	35	15.0
1740	40	17.1
1741	27	11.2
1742	27	11.4
1743	31	12.9
1744	22	9.1
1745	44	18.3
1746	69	30.1
1747	82	35.4
1748	38	15.6
1749	46	18.4
1750	46	18.6
1756	39	14.8
1757	34	12.9
1758	38	13.9
1761	29	9.7
1765	49	15.1
1766	51	15.5

Source: Robert H. Jackson (2015: 256-257).

Table 2. Crude marriage rate per thousand population at San Francisco Xavier Mission (Chiquitania), in selected years.

Year	Population	Number of marriages	Crude marriage rate
1702	4,117	31	7.8*
1724	3,409	10	3.0*
1728	3,770	45	12.1*
1733	3,663	16	4.0*
1739	1,710	153	81.6
1740	1,789	51	29.8
1741	1,894	73	40.8
1744	1,895	16	8.3*
1745	1,905	38	20.1
1746	1,914	32	16.8
1747	1,913	35	18.3
1748	1,947	16	8.4
1749	1,946	16	8.2
1750	1,968	72	37.0
1753	2,010	11	5.5*
1754	1,875	13	6.5
1756	1,898	2	1.0
1759	1,861	22	11.9*
1762	1,834	62	32.6
1763	1,831	27	14.7
1764	1,724	39	21.2
1765	1,511	74	42.9
1767	1,527	37	24.4*

*Estimated

Source: Robert H. Jackson (2015: 187-198, 207-210).

Table 3. Crude marriage rate per thousand population at San Francisco Xavier Mission (Misiones, Argentina), in selected years.

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Year	Population	# of Children	Percentage	Average family size
1712	1,796	614	34.2	4.0
1718	1,690	616	49.1	3.3
1738	2,342	1,152	49.1	4.2
1739	2,364	1,174	49.7	4.2
1740	2,421	1,235	51.0	4.4
1741	2,378	1,236	52.0	4.3
1742	2,413	1,276	52.9	4.4
1743	2,416	1,269	52.5	4.4
1744	2,403	1,258	52.4	4.3
1745	2,293	1,126	49.1	4.2
1746	2,314	1,119	48.4	4.0
1747	2,435	1,167	47.9	4.0
1748	2,497	1,203	48.2	4.0
1749	2,480	1,185	47.8	4.0
1750	2,550	1,245	48.8	4.0
1755	2,578	1,308	50.7	4.3
1756	2,639	1,347	51.0	4.3
1757	2,728	1,422	52.1	4.3
1758	2,799	1,462	52.2	4.4
1760	2,978	1,629	54.7	4.5
1761	3,065	1,700	55.5	4.6
1764	3,256	1,813	55.7	4.6
1765	3,302	1,790	54.0	4.5
1766	3,201	1,679	52.5	4.5

Source: Catálogo de la Numeración Annual de las Misiones de Chiquitos, Biblioteca Nacional, Archivo General de la Nación, Buenos Aires, 6127-14, 6467-101; individual anuas for San Francisco Xavier Mission 1738, 1740, and 1741.

Table 4. Children (under age 15) as a percentage of the total population of San Francisco Xavier Mission, in selected years.

Mission	1744	1746	1758	1761	1764
Xalpa	1,445	1,205	980	985	-
Conca	449	248	423	407	365
Landa	564	401	646	407	537
Tilaco	659	416	894	935	704
Tancoyol	574	207	547	515	253

Source: Robert H. Jackson (2015: 139).

Table 5. Population of the Sierra Gorda Missions, in selected years.

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Mission	Baptisms	Burials	Net +/-
Santiago de Xalpa	1,277	1,772	-495
San Miguel Concá	338	699	-361
Agua de Landa	780	952	-172
Tilaco	877	1,138	-306
Tancoyol*	336	784	-448
Total	3,608	5,390	-1,782

*1747-1764

Source: Joséph de la Madre de Dios Hererra, Santiago de Xalpan, October 14, 1758, Informes sobre las Misiones de Conca, Tancoyol, Landa, Tilaco y Xalpan; Juan Ramos de Lora, Tancoyol, November 15, 1764, Razon de el estado en que se hallan las cinco misiones de Sierra Gorda que están al cuidado y cargo de los Religiosos de el Appostolico Colegio de Propaganda Fide de San Fernando de Mexico, hoy dia 15 de Noviembre de el años de 1764. (Lino Gómez Canedo, 2011: 221-236, 251-255).

Table 6. Baptisms and burials recorded in the Sierra Gorda Missions, 1744-1764.

Mission	c. 1748	1758	1761	1764
Xalpa	3.1	3.4	3.6	-
Conca	2.8	3.2	4.0	4.1
Landa	3.0	3.5	3.6	3.6
Tilaco	3.8	3.7	3.5	3.7

Source: Joséph de la Madre de Dios Hererra, Santiago de Xalpan, October 14, 1758, Informes sobre las Misiones de Conca, Tancoyol, Landa, Tilaco y Xalpan; Juan Ramos de Lora, Tancoyol, November 15, 1764, Razon de el estado en que se hallan las cinco misiones de Sierra Gorda que están al cuidado y cargo de los Religiosos de el Appostolico Colegio de Propaganda Fide de San Fernando de Mexico, hoy dia 15 de Noviembre de el años de 1764 (Lino Gomez Canedo, 2011: 221-236, 251-255).

Table 7. The average family size on the Sierra Gorda Missions, in selected years.

Mission	1758	1761	1764
Xalpa	36	37	-
Conca	36	45	44
Landa	37	40	40
Tilaco	37	36	41
Tancoyol	29	33	38

Source: Joséph de la Madre de Dios Hererra, Santiago de Xalpan, October 14, 1758, Informes sobre las Misiones de Conca, Tancoyol, Landa, Tilaco y Xalpan; Juan Ramos de Lora, Tancoyol, November 15, 1764, Razon de el estado en que se hallan las cinco misiones de Sierra Gorda que están al cuidado y cargo de los Religiosos de el Appostolico Colegio de Propaganda Fide de San Fernando de Mexico, hoy dia 15 de Noviembre de el años de 1764 (Lino Gomez Canedo, 2011: 221-236, 251-255).

Table 8. Children as a percentage of the total population on the Sierra Gorda Missions.

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Tancoyol						
Family size	Two	Three	Four	Five	Six	Seven
# Families	40	23	22	8	8	2
# People	80	69	88	40	48	14
		Their children				
Widowers	5	8				
Widows	1	1				
Single	10					
Total population: 364						
Rancheria de Soyapila						
Family size	Two	Three	Four	Five	Six	Seven
# Families	29	29	3	8	2	0
# People	58	87	12	40	12	0
		Their children				
Widowers	0	0				
Widows	0	0				
Single	1					
Total population: 210						

Source: Joaquin Meade y Sainz Tapaga (1951: 425-431).

Table 9. Structure of the population of Tancoyol Mission in 1744.

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Tilaco						
Family size	Two	Three	Four	Five	Six	Seven
# Families	22	35	43	18	3	1
# People	44	105	172	90	18	7
		Their children				
Widowers	4	7				
Widows	0					
Single	0					
Total population: 448						
Rancho de El Lobo						
Family size	Two	Three	Four	Five	Six	Seven
# Families	10	11	11	8	2	0
# People	20	33	44	40	12	0
		Their children				
Widowers	0					
Widows	0					
Single	0					
Total population: 149						
Laguna Grande						
Family size	Two	Three	Four	Five	Six	Seven
# Families	5	1	6	5	0	0
# People	10	3	24	25	0	0
		Their Children				
Widowers	0					
Widows	0					
Single	0					
Total population: 62						
El Humo						
Families: 20		Total population: 90		Average family size: 4.5		

Source: Joaquin Meade y Sainz Tapaga (1951: 408-413).

Table 10. Structure of the population of Tilaco Mission in 1744.

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